

I claim:

1. A system for processing citrus peel to produce useful liquid and solid products, said system comprising:

5 conduit means for conveying citrus peel, liquid, liquid products and solid products through said system;

cutting means to cut said citrus peel into particles to create a slurry of solid particles and liquid;

first tank means to receive and heat said slurry of solid particles and liquid;

10 first separator means to separate said solid particles and said liquid from said first tank means;

finisher means to separate said liquid from said first separator means into waste solids and finished liquid;

15 centrifuge and decanting separator means to separate said finished liquid from said finisher means into citrus peel oil, liquid products and waste sludge;

polisher means to produce high grade peel oil from said citrus peel oil;

evaporator means to separate said liquid products from said centrifuge and decanting separator means into water for recycling within said system, food grade citrus peel juice and aromas and essences;

20 first press means to remove liquid from said solid particles from said first separator means for recycling to said first tank means;

second tank means to receive and heat said solid particles from said first press means, and to receive recycled liquid from said polisher means and from a second separator means;

second separator means to separate said solid particles and said recycled liquid from said second tank means;

5 second press means to remove liquid from said solid particles from said second separator means for recycling to said second tank means;

first dryer means to dry said solid particles from said second press means;

second dryer means to further dry said solid particles from said first dryer means to produce consumable peel mass products.

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2. The system of claim 1, wherein said cutting means are adapted to cut said citrus peel into said particles of approximately 0.1875 inches in size.

15 3. The system of claim 1, wherein said first tank means is adapted to heat said slurry to between approximately 120 to 140 degrees F.

4. The system of claim 1, wherein said second tank means is adapted to heat said solid particles to between approximately 110 to 135 degrees F.

20 5. The system of claim 1, wherein said first dryer means is adapted to dry said solid particles at up to 350 degrees F.

6. The system of claim 1, wherein said second dryer means is adapted to dry said solid particles from said first dryer means at less than 150 degrees F.

7. The system of claim 1, wherein said cutting means comprises a blade-type disintegrator.

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8. The system of claim 1, wherein said first and said second separator means each comprises a vibratory conveyor/shaker bed apparatus.

9. The system of claim 1, wherein said polisher means comprises a centrifuge apparatus.

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10. The system of claim 1, wherein said evaporator means comprises a thermally accelerated short term evaporation system.

11. The system of claim 1, further comprising pasteurization and de-bittering means to treat said liquid products from said centrifuge and decanting separator means prior to delivery to said evaporator means.

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12. A system for processing citrus peel comprising:

cutting means to cut said citrus peel into particles to create a slurry of solid particles and

20 liquid;

first tank means to receive and heat said slurry of solid particles and liquid;

first separator means to separate said solid particles and said liquid from said first tank means;

finisher means to separate said liquid from said first separator means into waste solids and finished liquid;

5 finishing separator means to separate said finished liquid into citrus peel oil, liquid products and waste sludge;

polisher means to produce high grade peel oil from said citrus peel oil;

evaporator means to separate said liquid products into water for recycling within said system, food grade citrus peel juice and aromas and essences;

10 first press means to remove liquid from said solid particles from said first separator means;

second tank means to receive and heat said solid particles from said first press means;

second separator means to separate liquid from said solid particles from said second tank means;

15 second press means to remove liquid from said solid particles from said second separator means; and

dryer means to dry said solid particles from said second press means;

wherein liquid from said first separator means and said first press means is recycled within said system, and wherein liquid from said second separator means and said second press  
20 means is partially recycled within said system and partially discarded from said system.

13. The system of claim 12, further comprising pasteurization and de-bittering means to treat said liquid products from said finishing separator means prior to delivery to said evaporator means.

5 14. A system for processing citrus peel comprising:

cutting means to cut said citrus peel into particles to create a slurry of solid particles and liquid;

first tank means to receive and heat said slurry of solid particles and liquid;

first separator means to separate said solid particles and said liquid from said first tank.

10 means;

means to produce high grade peel oil, food grade citrus peel juice, and aromas and essences from said liquid from said first separator means;

first press means to remove liquid from said solid particles from said first separator means;

15 second tank means to receive and heat said solid particles from said first press means;

second separator means to separate liquid from said solid particles from said second tank means;

second press means to remove liquid from said solid particles from said second separator means; and

20 dryer means to dry said solid particles from said second press means to produce consumable dried peel mass products;

wherein liquid from said first separator means and said first press means is recycled within said system, and wherein liquid from said second separator means and said second press means is partially recycled within said system and partially discarded from said system.

- 5 15. The system of claim 14, wherein said means to produce high grade peel oil, food grade citrus peel juice, and aromas and essences from said liquid from said first separator means comprises:

finisher means to separate said liquid from said first separator means into waste solids and finished liquid;

- 10 finishing separator means to separate said finished liquid into citrus peel oil, liquid products and waste sludge;

polisher means to produce high grade peel oil from said citrus peel oil; and

evaporator means to separate said liquid products into water for recycling within said system, food grade citrus peel juice and aromas and essences.

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16. The system of claim 14, further comprising pasteurization and de-bittering means to treat said liquid products from said finishing separator means prior to delivery to said evaporator means.

- 20 17. A method of processing citrus peel comprising:

cutting said citrus peel into particles to create a slurry of solid particles and liquid;

adding water to, heating and mixing said slurry of solid particles and liquid;

separating said solid particles and said liquid;

separating said liquid into waste solids and finished liquid;

separating said finished liquid into citrus peel oil, liquid products and waste sludge;

converting said citrus peel oil into high grade peel oil;

5        evaporating said liquid products to produce water for recycling within said system, food grade citrus peel juice and aromas and essences;

pressing said solid particles to produce liquid for recycling within said system;

adding water to, heating and mixing said solid particles;

separating liquid from said solid particles;

10       pressing said solid particles to produce water for recycling within said system and water to be discarded from said system;

drying said solid particles to produce food grade pectin pomace.

18.     The method of claim 17, wherein said step of separating said finished liquid into citrus  
15 peel oil, liquid products and waste sludge comprises centrifuging and decanting said liquid products.

19.     The method of claim 17, wherein said step of cutting said citrus peel into particles to  
create a slurry of solid particles and liquid comprises cutting said citrus peel into particles of  
20 approximately 0.1875 inches in size.

20. The method of claim 17, wherein said step of adding water to, heating and mixing said slurry of solid particles and liquid comprises heating said slurry to between approximately 120 to 140 degrees F.

21. The method of claim 17, wherein said step of adding water to, heating and mixing said solid particles comprises heating said solid particles to between approximately 110 to 135 degrees F.

22. The method of claim 17, wherein said step of drying said solid particles to produce food grade pectin pomace comprises a first drying step of heating said solid particles at up to 350 degrees F and a second drying step of heating said solid particles at less than 150 degrees F.

23. The method of claim 22, wherein said first drying step is performed faster than said second drying step.

24. The method of claim 23, wherein said first drying step is performed for approximately 3 to 9 minutes on a fluidized bed dryer and said second drying step is performed for approximately 40 to 58 minutes on a multi-conveyor dryer.

25. The method of claim 17, further comprising the step of pasteurizing and de-bittering said liquid products prior to said step of evaporating said liquid products.



26. The method of claim 17, wherein said step of separating said solid particles and said liquid and said step of separating liquid from said solid particles is performed on a vibratory conveyor/shaker bed apparatus.

5 27. The method of claim 17, wherein said step of evaporating said liquid products is performed on a thermally accelerated short term evaporation apparatus.

28. The method of claim 17, wherein step of separating said solid particles and said liquid comprises recycling said liquid within said system, and wherein said step of separating liquid  
10 from said solid particles comprises recycling a portion of said liquid within said system and discarding a portion of said liquid from said system.

29. A method of processing citrus peel comprising:

cutting said citrus peel into particles to create a slurry of solid particles and liquid;

15 adding water to, heating and mixing said slurry of solid particles and liquid;

separating said solid particles and said liquid;

separating said liquid into waste solids and finished liquid;

separating said finished liquid into citrus peel oil, liquid products and waste sludge by centrifuging and decanting said liquid products;

20 converting said citrus peel oil into high grade peel oil;

pasteurizing and de-bittering said liquid products;

evaporating said liquid products to produce water for recycling within said system, food grade citrus peel juice and aromas and essences;

pressing said solid particles to produce liquid for recycling within said system;

adding water to, heating and mixing said solid particles;

5 separating liquid from said solid particles and recycling a portion of said liquid within said system and discarding a portion of said liquid from said system;

pressing said solid particles to produce water for recycling within said system and water to be discarded from said system;

drying said solid particles to produce food grade pectin pomace, wherein said drying is  
10 preformed first as a high temperature, short dwell time operation and second as a low temperature, long dwell time operation.

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